

CHAPTER 1

INTRODUCTION

1.1 Background Study

1.1.1 Propolis

Propolis or usually referred as bee glue is a type of resin. The propolis is collected from various species of bees based on the topography of the location where the bees originated. The bees use the propolis in construction and repair of their hives due to the stickiness nature of propolis. The United States Department of Agriculture described propolis as a gum that is gathered by the bees from various plants that may vary in color from light yellow to dark brown (United States Department of Agriculture, 1985). It also causes staining of the comb or frame and may be found in the extracted honey. The difference in the color is found to be due to the composition difference in the raw propolis. Although, the raw propolis content might vary as it changes with different location however, they are generally consist of five main materials which are 50% of resin and vegetable balsam, 30% of the wax, 10% of the essential and aromatic oils, 5% of the pollent and 5% of the other various substances such as the organic debris (Honary et al., 2011). The main nutritional compounds that can be found in the propolis are proteins (a maximum of 1 g/ 100 g), carbohydrates (a maximum of 1 g/ 100 g) and fat (a maximum of 1 g/ 100 g) (Bogdanov, 2016). Propolis is found to have lots of medicinal benefits for humans. Propolis is said to function as an anticancer, antibacterial, antiviral, antifungal, antioxidant and anti-diabetes properties (Król et al., 2013). All these health benefits are

subjected to certain types of propolis; for example, the anti-diabetes effect is only valid for *Poplar* and *Baccharis*-type of propolis (Bogdanov, 2016).

The usage of propolis started since 300 B.C. where it was usually used as home remedies and personal products (Ghisalberti, 1979). Since then, there is an increase in the usage of propolis in many fields such as pharmaceutical and food industry (Nori et al., 2011). The usage form is also differentiated as to aid the easiness among the users. There are various forms of propolis found in the market, from the fresh propolis to propolis in liquid and powder form. These various forms are to mask the weakness of the raw propolis as well as to aid the usage of the customers. The powder form of propolis is the famous type of propolis to be used in the manufacturing, considering the powder having a good stability. Various ways are being employed such as the spray and freeze drying to obtain the propolis powder. These drying processes produce a uniform size of the powder which will assist in the packaging of the powder such as tablet or capsule form.

1.1.2 Freeze Drying

Lyophilization or freeze drying process is one of the very popular method of producing powdered product or frozen items in food and pharmaceutical industry. It is a process where it involves removal of water or another solvent from a frozen pharmaceutical product (Labconco, 2010). This technique had been used for many years in both the industries. This technique is usually used to produce powder through rapid freezing and heating. Specialized equipments are involved in this technique to provide optimum temperature and pressure. The process could be divided into three parts which consist of freezing, primary drying and secondary drying. The freeze drying process consists of a clear process flow in which the water will be frozen first, continued by the removal of the water which has undergone the freezing process from the sample, initially be sublimation or know as the primary drying and then the secondary drying which is a desorption process (Nireesha et al., 2013). Freeze drying is regarded as the best method of water removal in order to obtain a high quality final product. This is due to the fact that the low temperature inhibits the microbiological activities of the product which provides an

excellent quality of powder. Besides that, this technique also protects the primary structure of the product as well as increases the shelf life of the product (Ratti, 2012). This criterion makes the freeze drying technique as the most suitable technique for production of pharmaceutical powdered based product.

1.1.3 Capsule

Capsule which the name is derived from Latin was invented early in the 19th century when there was a need to remove obnoxious taste present in most medicinal substances. This is due to the reason that it usually cause nausea among patients consuming it (Swarbrick, 1996). The invention of this dosage form is due to certain disadvantages found in the tablet dosage forms such as tablet manufacturing requires many detailed steps which are a burden to the pharmaceutical companies. Besides, those tablets dosage forms are hard to swallow by the children and elderly people (Kathpalia, Sharma, and Doshi, 2014). Based on the research conducted by the CAPSUGEL[®], it is found that out of 750 consumers, almost 57% prefer capsules over tablets or any other oral dosage (CAPSUGEL, 2010). Capsules can be divided into two types which are soft-shelled capsule and hard-shelled capsules. These two types of capsules are used for different types of drug ingredients, dry powders for hard capsules and oil for soft capsules. Both capsules have the same general benefits such as easier product identification, fewer developmental problems and consuming easiness (Qureshi, 2007).

1.2 Problem Statement

Raw propolis is sticky and gluey in normal environment condition. This condition may due to the presence of other substances such as resin, vegetable balsam and other refined propolis extract (Honary et al., 2011). This physical instability is found to cause a problem in the manufacturing of the propolis capsule. The propolis powder is packed in capsules rather than tableting or performing other method due to that capsules are more stable and have an accurate dosing as well (Qureshi, 2007). The sticky gel condition is found to affect the capsule that is being filled. The capsules tend to become oxidized and soften easily due to the reaction between the propolis with the capsule wall. Besides that,